Abstract of the Disclosure

A SAR radar avoids the need for an INS/GPS by focusing a SAR image having discernible features and a center. The image is formed from digitized returns, each of said digitized returns having a phase and an amplitude. The focusing steps are:

    storing digitized returns acquired in an azimuth and a range coordinate system;

5   searching within said memory for returns descriptive of the features;

    computing a coarse range and coarse range rate of the center of said image from the change in position of the features within the azimuth and range coordinate system;

    motion compensating the digitized returns forming the image using the coarse

10 range and coarse range rate to form a coarse image;

    converting the digitized returns in polar format into an orthogonal Cartesian coordinate system where the digitized returns are adjusted in phase and amplitude to form an evenly spaced image data ;

    autofocusing the evenly spaced image data to obtain a focused image;

15 performing a two dimensional Fourier transform to obtain a focused image described by the returns;

    testing the focused image for a focus quality ;

    computing an estimated (fine) range and (fine) range rate from features contained within the focused image;

20 converting the fine range and fine range rate within the orthogonal Cartesian coordinate system for use within the azimuth and range coordinate system and motion compensating the digitized returns;

    iterating the motion compensating step and subsequent steps using the fine range and the fine range rate until the attributes of focus quality reach a predefined

25 level.

    The autofocus step generates a phase error, said phase error is converted to an adjustment to said fine range. The adjustment is fed back to the motion compensating step.